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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/863,291	05/24/2001	Kazunori Anazawa	109593	9227

25944 7590 10/25/2002

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EXAMINER

LISH, PETER J

ART UNIT	PAPER NUMBER
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1754

DATE MAILED: 10/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/863,291

Applicant(s)

ANAZAWA ET AL.

Examiner

Peter J Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 states that the pressure inside the system is raised to at least 1.3 kPa to 93.3 kPa. The term “at least” followed by a specific range is indefinite and unclear.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Withers et al. (USPN 5,876,684).

Withers et al. disclose a method for the production of fullerenes and nanotubes in a suitable heat generating system, such as an arc created between two electrodes (See Figures 13a and 13b). In this method, a fluid form that may be carbon particulates or a form of hydrocarbon in a liquid or gaseous state are continuously fed to the reaction zone and supplied with heat from

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the source in an atmosphere and under other conditions that cause formation of fullerenes (column 2, lines 1-13). These atmospheres are within the range of 10^{-6} to 760 torr in certain instances and more preferably between 100-200 torr (column 2, lines 38-45). Because hydrogen can interfere with the fullerenes ring closure, hydrocarbons with low hydrogen/carbon ratios such as benzene, naphthalene, etc. are preferred (column 9, lines 60-67). Withers et al. also teach the process of evacuating the system to 10^{-3} torr before pressurizing the system and creating the arc (Example 1). The process of Withers et al. provides the economics of continuous operations and can be scaled into large operations as contrasted to prior art graphite rod processes (column 9, lines 27-32).

Concerning claims 4 and 7, Withers et al. disclose an apparatus comprising electrodes for arc discharge, a carbon liquid supply unit and a carrier gas supply unit (See figures 13a and 13b). They teach, "the quenching gas may be introduced in the chamber comprising the reactor through a passageway that may be provided in an electrode, through the carbon supply feed tube, or generally into the container (column 4, lines 50-54). Withers et al. also teach the advantages of cooling the region surrounding the reaction zone by the use of water cooled coils surrounding the electrodes, in order to enhance quenching of the vaporized carbon and the collection of fullerenes (column 5, lines 8-13).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Withers et al.

Whereas Withers et al. do not specifically teach an apparatus capable of spraying a mist of carbon liquid into the reaction zone, they do teach that when employing a solid carbon source, particulates of a very small size (micron diameters) be used in order to achieve a quick and complete vaporization. Thus, it would be obvious to one of ordinary skill at the time of invention to use a fine mist of liquid carbon feed in order to achieve a quick and complete vaporization.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Withers et al. as applied to claim 4 above, and further in view of Smalley et al. (USPN 5,227,038).

Withers et al. do not provide for a gap adjustment mechanism in his apparatus, however they do teach that the pyrolyzed carbons can deposit on the electrodes and alter the electrical operation of the arc (column 10, lines 53-55). Smalley et al. teach that it is necessary to provide some means for maintaining a consistent arc gap between the two electrodes. He teaches the use of a spring connected to one or both of the electrodes to urge one toward the other with a relatively constant force (column 4, lines 34-46). It would be obvious to one of ordinary skill at the time of invention to include the gap adjustment mechanism of Smalley et al. in the apparatus of Withers et al. in order to prevent the altering of the electrical operation of the arc due to carbon deposition on the electrodes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 703-308-1772. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-305-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

PL
October 16, 2002



STUART L. HENDRICKSON
PRIMARY EXAMINER